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VIKING SHIP BRAND FUSE

25X1A

Appearance of the Samples

The outward appearance of the three samples is tabulated below:

	<u>Diameter</u>	<u>Outward Appearance</u>
White Viking Ship Brand	.195	Dull white, outside counteracting yarns not always well filled; soft, smooth surface; fuse is flexible and limp.
Black Viking Ship Brand	.199	Similar to Black Wax Charter Oak, black finish slightly more tacky than Montan Wax; Fuse more limp than E-B brands, but stiffer than White Viking Ship Brand.
Plastic Viking Ship Brand	.188	Small diameter, very smooth thin white plastic finish. Very attractive appearance. Fuse flexible but less so than others tested.

Materials of construction of the three fuses is as listed below:

	<u>White Viking Ship Brand</u>	<u>Black Viking Ship Brand</u>	<u>Plastic Viking Ship Brand</u>
(a) Centerthread	one strand cotton, dry, 18/2 approximately (one black and one white ply) .044#/M'	the same	the same
(b) Powder	Potassium nitrate powder similar to those we use but less glaze. 17-19 grains/ft.; 2.6#/M'	the same	the same
(c) Spinning Yarns	12 yarns, lighter in color and stiffer than Jute, identified as probably RAMIE, approx. equivalent to 10# Jute, applied at approx. 15 TPF; approx. 3.0#/M'	the same	the same
(d) First Counteracting	5 yarns, same fiber as spinning yarns, approx. 4-6# Jute equivalent, applied at approx. 33 TPF; approx. .9#/M'	the same	the same

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- (e) Waterproofing One Thickness of black material with some rubberlike properties. Easily peeled from core. Burns with odor of rubber. M.P. B&R 288°F. Pen. @ 77°F 15; Approx. 4.4#/M' Same as White. Approx. 4.4#/M' Same as White Fuse. Approx. 5.4#/M'
- (f) Outside Countering 10 yarns cotton, single strand, about 5/1, applied at approx. 15 TPF Approx. .98#/M' 9 yarns, appears to be Jute, about equivalent to 4.8# applied at approx. 14 TPF None Present Approx. 1.2#/M'
- (g) White Finish Clay or other mineral filler and adhesive. Adhesive not animal glue, test with KI & I indicates it is not starch.
- (h) Black Finish Bitumen approx. 2.2#/M'
- (i) Plastic White pigmented plastic, heavier than water burns when held in flame. Odor on burning is slightly fatty. Applied directly over waterproofing about .006" thick. Very uniform and concentric coat. Approx. 1.7#/M'

I. Burning Rate in 3' Lengths in Air (10 samples from each of 2 coils)

	<u>White</u>	<u>Black</u>	<u>Plastic</u>
Number of Burns	20	20	20
Range	129.2-132.9	134.4-138.6	119.3-121.4 (seconds
Average	130.83	136.64	120.38 per yard)

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	<u>White</u>	<u>Black</u>	<u>Plastic</u>
Coefficient of Variation	.93	.83	.62
Quality of Burn	Little smoke, no side sparks, quiet, frequent venting, adequate end spit.		

No burns were conducted in varying lengths. This fuse is free venting and it is anticipated that no significant change in burning rate would be evidenced by change in length burned.

II. Burning Rate Under Water

Three 3-foot samples were burned under approximately 1" of water @ 77°F with the following results:

	<u>White</u>	<u>Black</u>	<u>Plastic</u>
Average	131.9	121.7	99.6
Dry Burning Speed	130.93	136.64	120.38
% Acceleration Over Dry Burn	-.82	10.93	17.25
Change in Speed, seconds per yard	+1.9	-14.94	-20.78

The white fuse burns slightly slower under water and is in this respect comparable to our white finished fuses.

The black fuse accelerates when burned under water in a manner similar to our wax finished fuses.

The plastic coated fuse shows excessive speed-up when burned under water.

PRESSURE TESTS

Two 10-foot lengths of each type of fuse were held for one hour under 100 pounds per square inch water pressure. The ends of these samples were sealed with an asphalt dip and electrician's tape. The following results were obtained:

	<u>White</u>	<u>Black</u>	<u>Plastic</u>
	1 o.k.	2 o.k.	2 o.k.
	1 out 1		

MANDREL TEST

A standard mandrel test was conducted with the following results:

	<u>White</u>	<u>Black</u>	<u>Plastic</u>
1/2"	o.k.	out 1	3 outs
	o.k.	out 1	1 out

1/4"

3+ outs

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The mandrel test results on the white and black fuses are good, probably because of the superior rubberlike waterproofing coat. The plastic fuse shows poor mandrel tests when compared to plastic coated fuse of US manufacture. The underlying coating on the plastic fuse may not be as good as in the other fuses and as it cracks in the mandrel test it cracks the plastic coat.

CAP CRIMP TESTS

To check the effectiveness of the cap to fuse joint, caps were crimped on this fuse using a Superior crimper with 3' samples. The fuse was immersed in 30" of water, cap end down for 24 hours.

<u>White</u>	<u>Black</u>	<u>Plastic</u>
1 o.k.	4 o.k.	5 o.k.
4 Failures	1 Failure	

In a repeat test at 4 hours' immersion, the following results were obtained:

<u>White</u>	<u>Black</u>
5 o.k.	5 o.k.

In a breakdown test of the crimping effectiveness of the plastic fuse, samples were exposed for 16 hours at 100 pounds per square inch.

3 Failed	1 o.k.
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These crimp test results are not significantly different from that which we find on US white finish fuses or our wax finished fuses. On fuse coated with polyethylene plastic, we have had much superior results on cap crimp tests. Some of our excellent results have been obtained on fuses, the diameter of which was approximately the same as this sample. However, in these instances, the plastic coat was considerably thicker and of a different material than on the Viking Ship Brand Plastic Fuse.

Comments

These fuses are of interest from several standpoints; the black and white Viking Ship Brands particularly, because they are fuses of good quality but ones which should be possible to make at less material costs than our fuses. Based on these small samples, it is difficult to adequately appraise their quality. However, our tests would indicate that their burning regularity and water resistance are at least as good as US stock brands, and it is significant that less powder is used and that on the black and white fuses the other coatings probably are less expensive than our better stock brands.

Burning regularity of the individual samples is good, but attention is called to the wide variation between the three samples 130.83, 136.64, 120.38 seconds per yard. This leaves a question as to whether there is a standard speed for any of the fuse. Would such variations occur from shipment to shipment of one of their fuses? They are all called Viking Ship Brand and a range of from 119.3 to 138.6 seconds per yard was found in the three when burned dry, from 99.6 to 138.6 seconds per yard when considering both wet and dry burns.

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The most interesting feature of the white and black Viking Ship Brand Fuses is the waterproofing material which has rubberlike properties and probably accounts for the good water resistance obtained in spite of the cheap construction.

Except for its superior appearance, the plastic fuse is not felt to be a good product. Like other plastic fuses, it is subjected to the difficulty of fast burning rates when burned under water. It is interesting to note, however, the very attractive plastic finish that has been applied to this fuse with the thickness of plastic of only about six mils.

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